ORIGINAL ARTICLES

DIAPHRAGMATIC HERNIA: RESULTS OF SURGICAL TREATMENT IN 210 CASES*

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THE subject of the diagnosis and treatment of diaphragmatic hernia has received more consideration in recent years because its more frequent recognition has changed its status from a rare condition to one that is not infrequently encountered. However, I believe that this subject deserves more general interest and consideration than it is now given, since in many instances the diagnosis is not made until complications have occurred. This subject is of interest to the clinician because the diagnosis is of first importance, the symptoms are often complex and the condition frequently must be considered in the differential diagnosis of diseases of the upper part of the abdomen and lower part of the thorax. It is of interest to the roentgenologist because the roentgenologic recognition of diaphragmatic hernia is often the only means by which a definite diagnosis can be established clinically. The treatment is of primary concern to the surgeon as operative replacement of the herniated viscera, and repair of the abnormal opening in the diaphragm are the only treatments that promise complete relief of symptoms.

Diaphragmatic hernia occurs more commonly than is generally thought. A review of the records of The Mayo Clinic revealed that, from January 1, 1908 to December 31, 1938 inclusive, a diagnosis of diaphragmatic hernia was made roentgenologically or at operation in 514 cases. Of the 514 patients, 247 were males and 267 were females. The oldest patient was eighty-two years of age and the youngest patient was three months of age. The average age of the patients was 43.7 years. In the first case that was observed at the Clinic the hernia was of the esophageal hiatus type, and was discovered at operation in 1908. The first roentgenologic diagnosis of a diaphragmatic hernia at the Clinic was made in 1911. This hernia was of the traumatic type. The first roentgenologic diagnosis of an esophageal hiatus hernia at the Clinic was made in 1921.

The more frequent recognition of diaphragmatic hernias in recent years is exemplified by the fact that a review of the cases observed between January 1, 1908 and December 31, 1925 inclusive, revealed that a diagnosis of this type of hernia was made in only thirty cases observed at the Clinic. In fourteen of the thirty cases the patients were treated surgically. From January 1, 1926 to December 31, 1938 inclusive, 484 patients received a diagnosis of diaphragmatic hernia, of whom I operated on 210. This study, therefore, disclosed that sixteen times as many diaphragmatic hernias were recognized in the last thirteen years as had been recognized in the previous eighteen years. I believe that the condition is even more common than the present records indicate. I have examined the diaphragm in the course of other abdominal operations and occasionally have found a small hernia that had not been recognized clinically or roentgenologically before operation.

This more frequent recognition of the condition in the last two decades has been attributed primarily to the development in roentgenologic methods of diagnosis. The clinical study of cases of proved diaphragmatic hernia has established rather definite symptoms which have enabled the clinician to diagnose the condition or to suspect its presence and request a special roentgenologic examination. I do not believe that the entire credit for the more frequent recognition of this condition is due the roentgenologist. I believe that he must share this credit with the clinician. A greater proportion of the responsibility for the establishment of the correct diagnosis must rest on the clinician. He is the first to see a patient, and the subsequent course of the examination and the treatment depend on his interpretation of symptoms.

Recognition of a diaphragmatic hernia clinically is often difficult because of the complex symptoms, which simulate those of other organic disease of the abdomen and thorax. This, I believe, is one of the most important clinical considerations of diaphragmatic hernia. It is particularly true in cases in which the hernias are progressive and the symptoms vary, depending on the degree and type of herniation. In such cases several clinical diagnoses can be made because of the changing symptoms. The condition may be termed the "masquerader of the upper part of the abdomen," because the symptoms frequently simulate those of other diseases. A study of the 210 patients on whom I operated between January 1, 1926 and December 31, 1938 inclusive, disclosed that an average of more than three previous erroneous clinical diagnoses had been made before the correct diagnosis was established. The most common erroneous diagnoses, in order of frequency, were cholecystitis, cholelithiasis, gastric ulcer, duodenal ulcer, hyperacidity, secondary anemia, cardiac disease, cancer of the cardia, stricture of the esophagus, appendicitis, and intestinal obstruction. This was of particular surgical significance, because in twenty-three of these cases the patients had been operated upon previously for other conditions, without complete relief of symptoms, and were completely relieved following repair of the hernia. Of these twenty-three patients, thirteen had undergone cholecystectomy, four had undergone cholecystostomy, three had undergone appendectomy, two had undergone pyloroplasty, and one had been subjected to a gastro-enterostomy. Five of these patients—two who had been subjected to operation for duodenal ulcer and three who had undergone an operation for

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TABLE 1.—*Data in 210 Cases of Diaphragmatic Hernia in Which Operation Was Performed*

Site of Opening	Cases	Cause	Cases	Content of Hernia	Cases
Esophageal hiatus	153	Congenital (history of trauma, 12 cases)	153	Stomach (omentum) Stomach, omentum and spleen Stomach and colon	144 3 6
(Short esophagus type)	11	Congenital	11	Stomach only	11
Hiatus pleuroperitonealis	4	Congenital	4	Colon and small bowel Colon, small bowel, stomach and spleen	3 1
Absence posterior fourth left diaphragm	4	Congenital	4	Stomach, colon, small bowel and spleen Small bowel and colon	3 1
Foramen Morgagni	2	Congenital	2	Colon and omentum	2
Left diaphragm	35	Trauma (indirect injury, 25 cases; direct injury, 6 cases) Inflammatory necrosis, 4 cases	35	Stomach only Stomach and colon Stomach, colon and small bowel Stomach, colon and spleen Stomach, colon, spleen and small bowel Stomach, colon, small bowel and liver Stomach, colon, small bowel, spleen and liver	5 10 5 2 9 2 2
Right diaphragm	1	Trauma (direct)	1	Stomach, colon, small bowel, liver (gall bladder) and head of pancreas	1
Total	210		210		210

gall-stones—had obtained partial relief of symptoms but had continued to have distress from an unrecognized esophageal hiatus hernia. This again emphasizes the importance of examining the diaphragm in the course of all operations on the upper part of the abdomen, particularly when the clinical syndrome has not been typical, or when the operative findings elsewhere than about the diaphragm do not adequately explain the patient's symptoms.

CLASSIFICATION

The conditions that influence the symptoms of diaphragmatic hernia depend to some extent on the type of hernia, whether it is congenital or acquired, and whether or not trauma has been an etiologic factor.

From a clinical standpoint, the history of preceding injury is helpful in establishing the clinical diagnosis and in determining the type of hernia, the urgency of the condition and the prognosis when operative treatment is employed. Because of the clinical and surgical significance of trauma as an etiologic factor, I have suggested that diaphragmatic hernia should be classified in two main groups—nontraumatic and traumatic—and I have subdivided these according to the various types.

A nontraumatic diaphragmatic hernia may be congenital or acquired. If congenital, the hernia is attributable to embryologic deficiency and usually does not have a hernial sac. The most common sites of a congenital hernia, in the probable order of frequency of occurrence, are: (1) through the hiatus pleuroperitonealis (foramen of Bochdalek), (2) through the dome of the diaphragm, (3) through the esophageal hiatus, (4) through the foramen of Morgagni, and (5) through the gap left by partial absence of the diaphragm, which is usually in the posterior portion of the muscle.

If the hernia is acquired after birth, the sites of occurrence are: (1) through the esophageal hiatus, with a type having a hernial sac, (2) through the region of fusion of the anlage of the diaphragm, and (3) at sites named under the congenital type.

Traumatic diaphragmatic hernia may be caused by direct or indirect injury, or by inflammatory necrosis of the diaphragm.

In case of indirect injury of the diaphragm, the hernia may occur at any point, including points of embryologic fusion; but the most common sites are the dome and posterior half of the left part of the diaphragm, or it may occur in the right part of the diaphragm. It usually is the result of a severe, crushing injury and the hernia may or may not have a sac. When the hernia occurs through the esophageal opening there is a sac, but when it occurs through the leaf of the diaphragm there usually is no sac.

In case of direct injury of the diaphragm, the hernia may occur at any point and is usually the result of penetrating wounds, such as those inflicted by a gun or a knife.

Rupture of the diaphragm may be the result of inflammatory necrosis which, in turn, has been caused by a subdiaphragmatic abscess, or rupture may follow necrosis caused by drainage tubes introduced into empyema cavities. In these cases the opening usually is in the posterior part of the diaphragm and there is no hernial sac.

Table 1 shows the sites of the opening in the diaphragm, the probable cause, and the contents of the hernias in 210 cases in which I operated for diaphragmatic hernia.

In a general way the various types of diaphragmatic hernia can be divided clinically into two main classes, depending on the abdominal viscera which are involved. In the first class the stomach is the only abdominal viscus incorporated in the hernia; the hernia usually occurs through the esophageal hiatus. In the second class, the intestines, with or without the stomach and other abdominal viscera, are included in the hernia. These hernias are usu-

ally of traumatic origin and are caused by laceration of a normal diaphragm. They also may be of congenital origin and may result from structural deficiency of the diaphragm.

Esophageal hiatus hernia is the most common kind of hernia through the diaphragm that is found among adults. This type of hernia is slowly progressive and constitutes a sliding herniation of the stomach into the posterior mediastinum. It may push into either or both thoracic cavities, but does not enter the pleural cavity. The stomach is usually the only abdominal viscus involved in the hernia. This type of hernia may progress until the entire stomach is contained within the hernial sac, and the colon, omentum, and occasionally the spleen may also be drawn into the hernial sac.

SYMPTOMS

The symptoms of esophageal hiatus hernia may begin at birth or at any time in life. This kind of hernia produces more uniform symptoms than do hernias elsewhere in the diaphragm. The symptoms are those of intermittent, and usually progressive, incarceration and obstruction of the stomach. It is because of the progressive character of the hernias that the symptoms vary, depending on the amount of stomach that becomes incorporated in the hernia, the degree of interference with the diaphragm as well as the size of the hernial orifice, and the occurrence of associated complications such as traumatic ulcer and incarceration of the stomach. At first the symptoms may be mild in character and consist of mild distress in the lower part of the substernal region. This distress occurs while the patient is eating and it often produces a sensation of obstruction to food entering the stomach. It is often accompanied by pain, which is situated in the midline of the epigastrium to the shoulder, and is projected through to the back. The symptoms are more marked after the patient has eaten heavy meals and in many instances they are particularly noted at night. They are usually relieved by belching of gas or by vomiting. As more of the stomach becomes involved in the hernia, the symptoms become progressively more severe. The epigastric pain and distress are often severe enough to simulate gallbladder colic. If traumatic erosions have occurred, there is often an associated gastric hemorrhage which may be noted in the vomitus, but it more commonly is evidenced by the presence of occult blood in the stool. A marked secondary anemia is present in about 10 per cent of cases; this was one of the chief symptoms observed in the cases at the Clinic. In cases of this type the symptoms often simulate those of peptic ulcer so closely that the patient is given ulcer treatment. In cases in which the hernia is extensive, the pressure of the herniated stomach on the pericardium and the reflex nervous disturbance cause symptoms which simulate heart disease that is associated with palpitation, dyspnea and pain that extends to the shoulder and neck through the phrenic nerve.

In cases in which the hernia has been present for a long time, there may be marked ulceration in the lower end of the esophagus, which later causes a stenosis as a result of cicatricial contraction. Patients who have esophageal hiatus hernia, of which the predominating symptoms are those of esophageal obstruction, are of particular interest and require careful clinical study. The symptoms may be attributable to an entirely unassociated lesion of the lower part of the esophagus, such as cardiospasm, carcinoma or diverticulum, or they may be the result of ulceration or stricture of the esophagus that is caused by the hernia. Because of the possibility that there may be a lesion in the lower end of the esophagus, which is caused by or is unassociated with a hernia, I believe an esophagoscopic examination is advisable in all cases in which the presence of a diaphragmatic hernia is suspected.

The chief symptoms of esophageal hiatus hernia depend, to some extent, on the time in the course of the disease at which the patient is examined, on the rapidity with which the hernia has been produced, on the amount of fixation of stomach in the thorax, and on the amount of disturbed function of thoracic organs.

The symptoms of traumatic hernia or of nontraumatic, congenital types of hernia, in which only the stomach is involved in the hernia, are essentially the same as those described, but they are usually more severe and acute and do not last. Cases of this sort are relatively rare, because in these types of hernia the large and small bowel, as well as the stomach, spleen, and occasionally the liver, usually are involved in the hernia. There is no limiting sac, and the herniated abdominal viscera are in direct contact with the lung and pericardium. The condition in these cases may be more properly termed "evisceration of the abdominal organs into the pleural cavity" rather than a "true hernia."

In cases of traumatic hernia the symptoms progress very rapidly, are severe in character, and are attributable to the mechanical interference with function of the herniated viscera as well as to marked interference with function of the heart and lungs. The symptoms in these cases are even more severe than those in congenital types of hernia because of the sudden alteration of the intrathoracic pressure as well as the mechanical interference with the function of the organs involved. The most marked immediate symptoms are usually those of respiratory and circulatory embarrassment. Later, severe hemorrhage from the gastro-intestinal tract may occur as a result of incarceration or strangulation of the hollow viscera. If the patient survives the acute condition, the later symptoms depend on the viscera involved. The symptoms may consist of obstinate constipation, the occurrence of large quantities of gas in the colon, and attacks of partial or complete intestinal or gastric obstruction. The sudden onset of symptoms in cases of traumatic hernia usually is related directly to the injury, and there is no question as to the clinical diagnosis. Surgical treatment is demanded because of the danger of cardiac and respiratory failure or of intestinal strangulation.

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(To be continued)